Introduction to Turning

I-DEAS® Tutorials: Turning Projects

In this tutorial, you'll learn some basic techniques for machining turned parts. You'll learn how building a setup for turning is different from building a setup for milling.

Learn how to:

- build a turning setup
- create a rough turn operation
- machine undercuts

Before you begin...

Prerequisite tutorials:

- all tutorials under the Modeling Fundamentals menu
- Introduction to Generative Machining
- Building a Setup Assembly
- Generating In-process Stock and Checking Validity
- Working with Tools and Tool Catalogs
- Picking Holes
- Setting Machining Parameters for Hole-making Operations

The file you need for this tutorial is distributed with the product. You must copy it into your local directory.

Move to the local directory where you want to copy the file. Then:

In UNIX:

cp $SDRC_INSTL/examples/nc/ tut_turn_intro.arc .

In Windows use:

copy %SDRC_INSTL%\examples\nc\ tut_turn_intro.arc .

If you can't copy the file, you may have to set up the variable needed to copy from the I–DEAS installation.

. sdrc_oadev

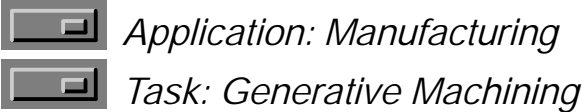If you can't access the file, contact your system administrator. The file may not be installed.

If you didn't start I-DEAS with a new (empty) model file, open a new one now and title it turning.
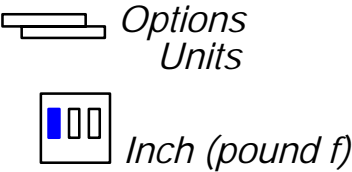
File
    Open

Open Model File form

Model File name: turning

OK

Make sure you're in the following application and task:

Application: Manufacturing

Task: Generative Machining

Set your units to inches.
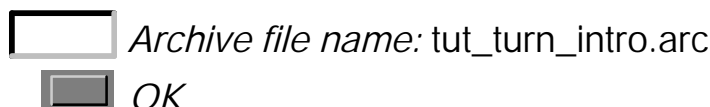
Options
    Units

Inch (pound f)

Import the archive file that contains the parts and tools that you need to complete this tutorial. Importing an archive file can take several minutes. Be patient.
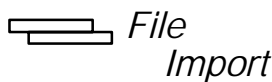
File
    Import

Import Selections form

I–DEAS Archive File

OK

File Name Input form

Archive file name: tut_turn_intro.arc

OK

The Manufacturing application quits, an informational message is displayed (the message will dismiss automatically), and the archive file is imported.
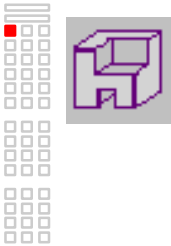
Import Archive File Status

Check *I-DEAS List*.

Be sure to check the List region to be sure that the parts imported properly.

Dismiss

A second informational message is displayed (the message will dismiss automatically) and the Manufacturing application starts.

Create a job.

NC Job Create form

Job Name: Trailer Ball Job

OK

Add the part to the job.

Get

From Bin/Library

Select Part/Assembly form

tut_trailer_ball

OK

Recovery Point

☐ *File*
    Save

Warning!
If you're prompted by I-DEAS to save your model file,
respond:

☐ No

Save only when the tutorial instructions tell you to—not
when I-DEAS prompts for a save.

If you make a mistake at any time between saves and
cannot recover, reopen your model file to the last save
and start over from that point.

Hint
To reopen your model file to the previous save, press
Control-Z.

For milling operations, you can build a very simple setup to complete your job. You merely align the part in relationship to the global coordinate system and generate your toolpaths.

For turning operations, however, the setup is a little more involved. You need to add machine and stock instances. A machine with an explicit machine coordinate system allows the software to guide the cuts. The stock enables the software to calculate the passes that compose the toolpath.

In the next few steps, you'll build a setup assembly from the following parts.
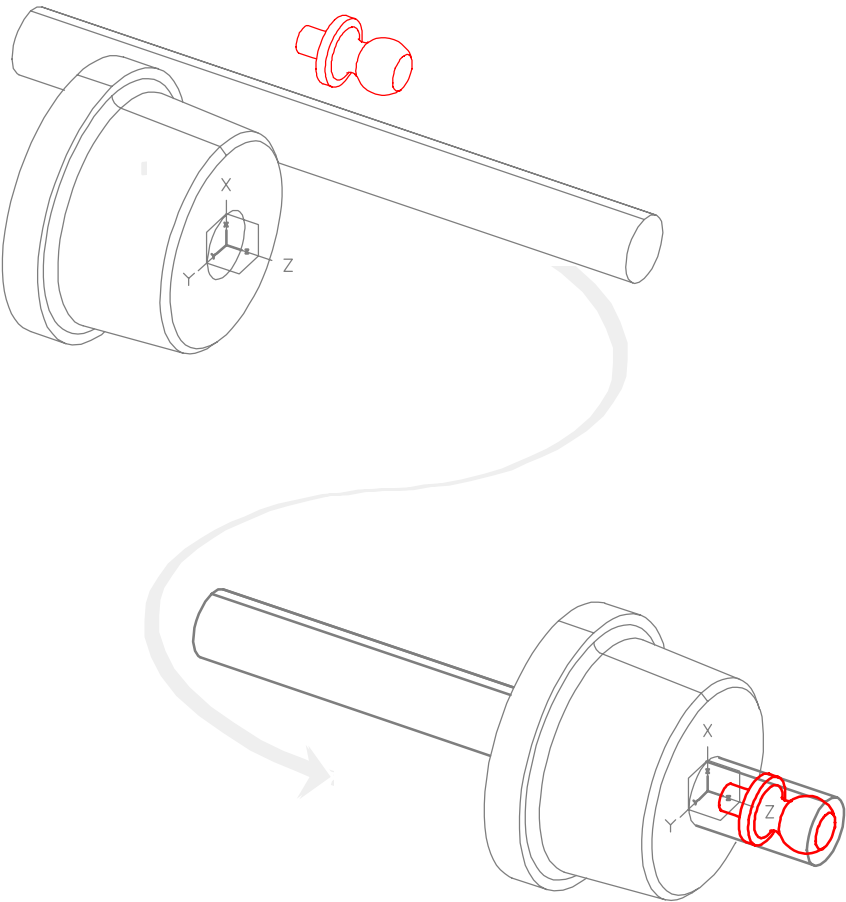
What: Modify the setup assembly.

How:

Setup Specification form

Name: Ball End Setup
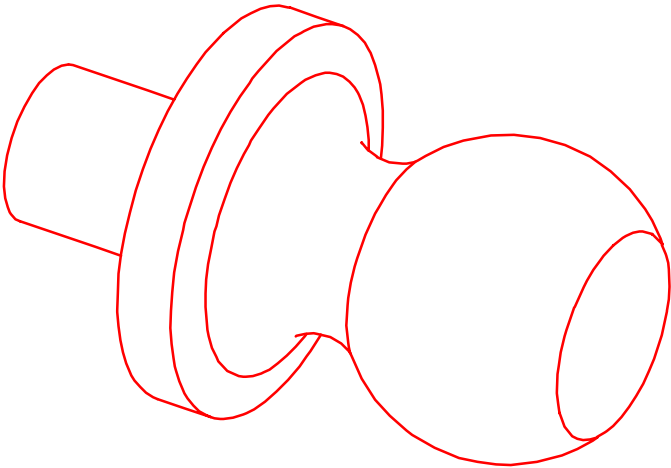
Dismiss

What: Add the machine instance, then create a coordinate system on it.

How:
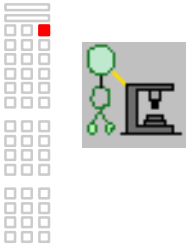
Add Machine form

     Get Machine From Bin/Library

Select Part/Assembly form

     tut_collet_chuck_2.5_inch

     OK

I-DEAS Warning

     Dismiss

Name form

     Name: Machine Assembly

     OK

 Don't close the Machine Data: Lathe/Millturn, General form.

Things to notice

The coordinate system that you see is related to the original part and not the machine assembly. You can create a machine coordinate system by picking this existing coordinate system.

What: Create the machine coordinate system for the setup.

How:

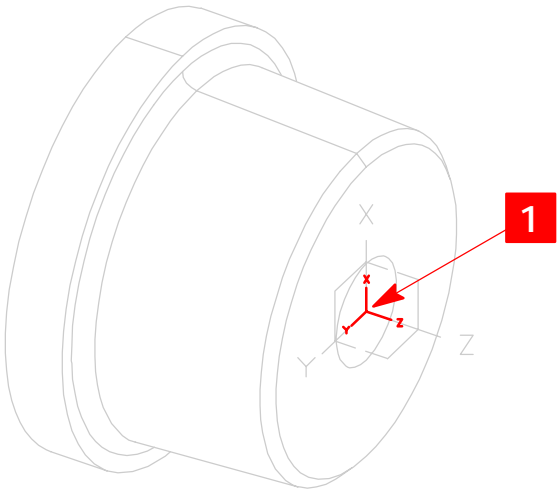## Machine Data: Lathe/Millturn, General form

⬛ Type: Turn

Create MCS

1 origin of the coordinate system

Done

🚫 Don't close the Machine Data: Lathe/Millturn, General form.

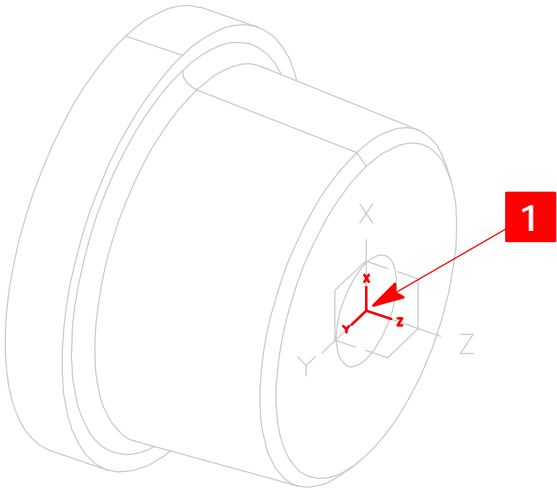**What:** Pick the machine coordinate system for the setup. This defines the coordinate system as program zero.

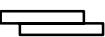**How:**

Machine Data: Lathe/Millturn, General form
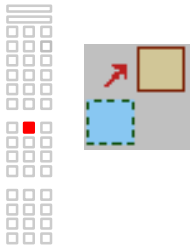
 Pick MCS

1 origin of the coordinate system

 OK

Recovery Point

 File
     Save

What: Align the centerline of the part to the centerline of the machine.

How:

1 anywhere on the part
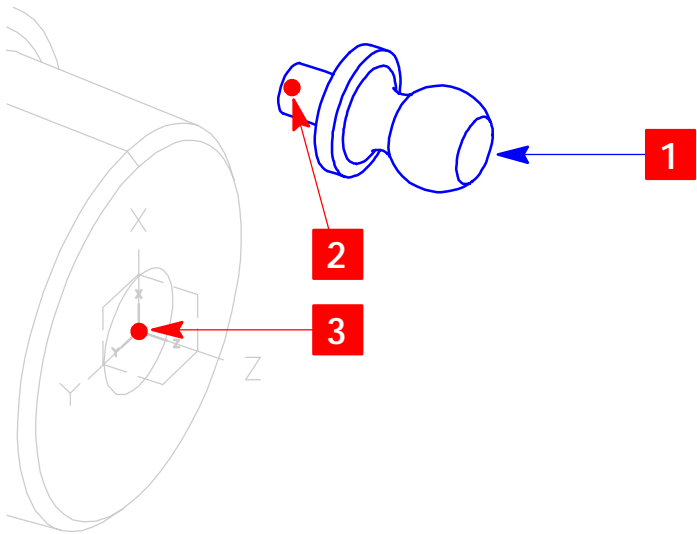

 Move To

2 CP13

3 CC8

🚫 After you've moved the part, don't quit out of this command. The steps continue on the next page.

What: Move the part away from the chuck along the centerline. The gap between the part and the chuck will allow a cutoff tool to pass between them in the next tutorial.
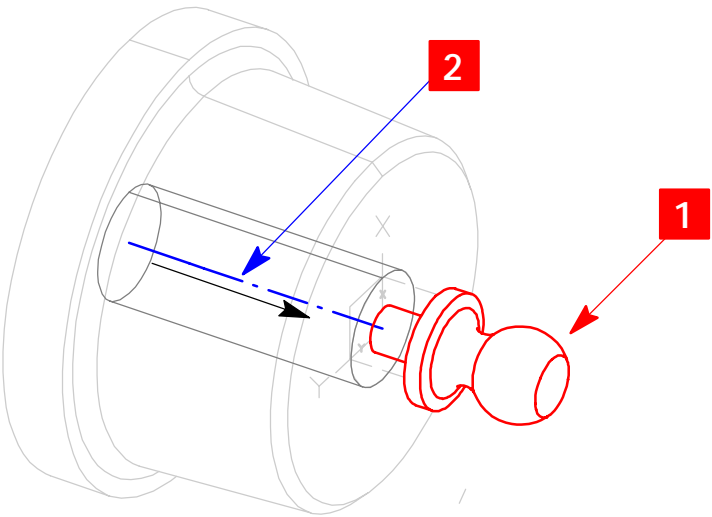
How:

1 anywhere on the part

[▊]

[▊] *Move Along*

2 CL1 (centerline on the chuck)
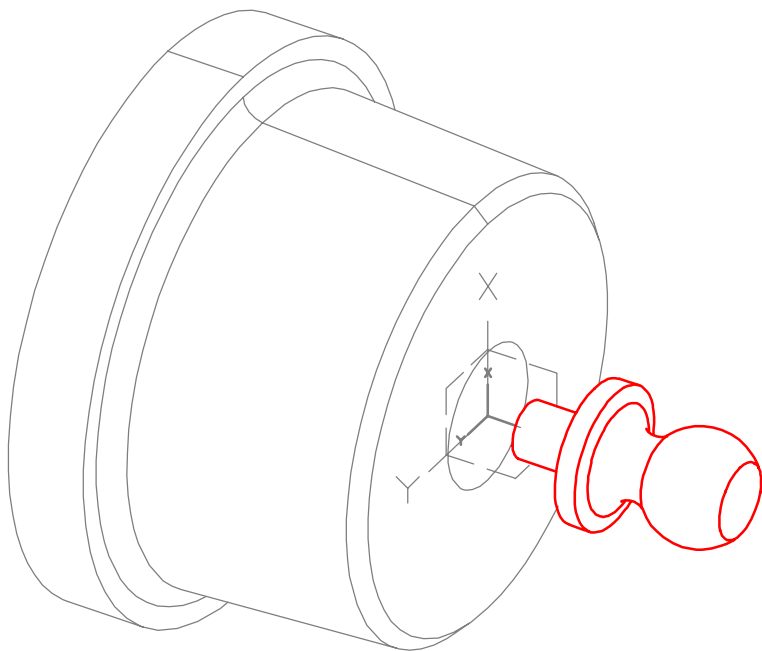
[▊]

[▊] Make sure the arrow is pointing towards the part by picking *Yes* or *No*.
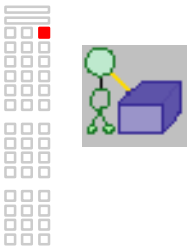
👀 Translation Distance: .75

[▊]

Result

Recovery Point

File
*   Save*

What: Add the stock to the setup assembly.

How:

 Get

 From Bin/Library
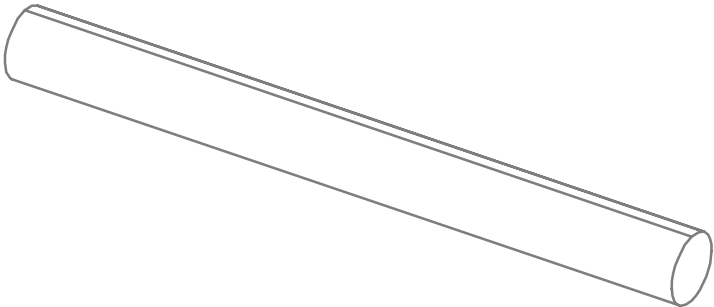

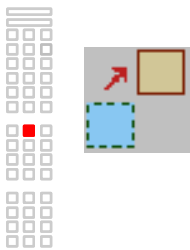## Select Part/Assembly form

 tut_bar_stock_2.5_inch

 OK

Recovery Point
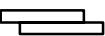
 File
　　　Save

What: Move the stock into position for machining.

How:

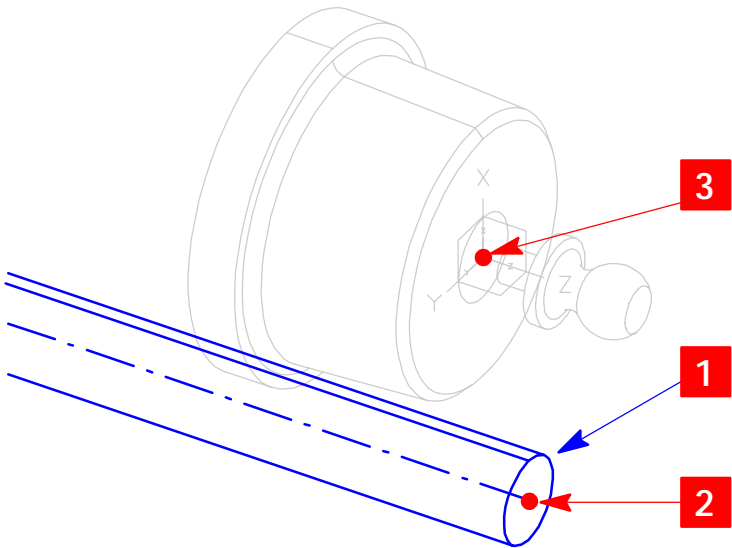**1** anywhere on the stock

 Move To

2 CP2

3 CC8

🚫 After you've moved the stock, don't quit out of this command. The steps continue on the next page.

What: Move the stock in relationship to the part.

How:

1 anywhere on the stock

Move Along

2 CL1 (centerline on the chuck)

Make sure the vector is pointing towards the part by picking *Yes* or *No*.
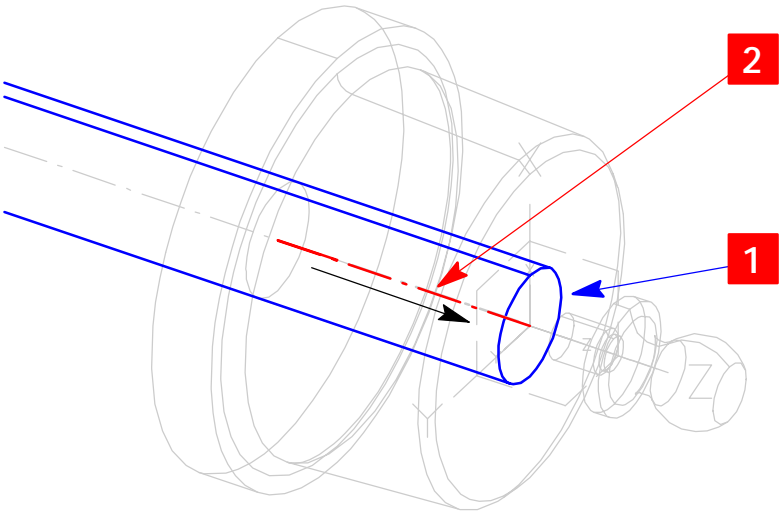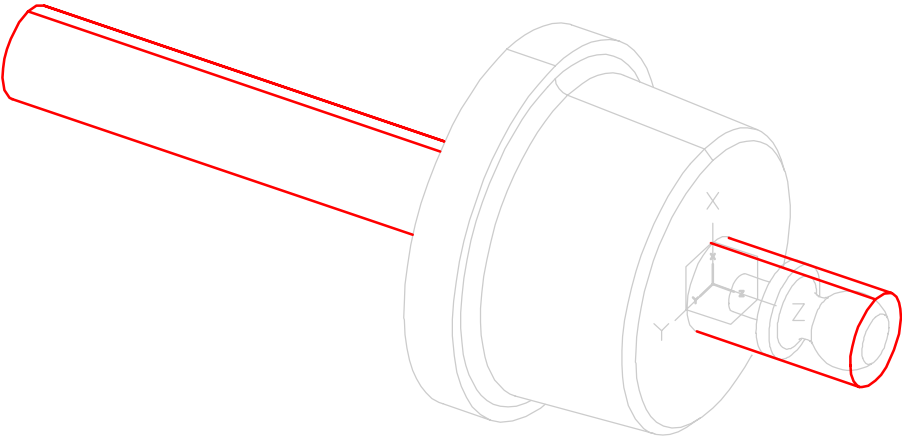
Yes

Translation Distance: 4.75

Recovery Point

File
   Save

Result

**What:** Define in-process stock calculations for the setup.

How:

Setup Specification form

    ☑ *Enable In-Process Stock Calculations*

    ▭ *Dismiss*

In the next steps, you'll create a rough turn operation to machine the ball end of the trailer hitch. After you generate the toolpath, you may notice that the tool doesn't completely cut the selected surfaces. Those uncut surfaces compose an *undercut*.

An undercut is a surface or collection of surfaces that has X or Z coordinates less than their adjacent surfaces.

In this operation, you'll machine the part without cutting into the undercut. You'll use a stronger tool to rough the surface first.
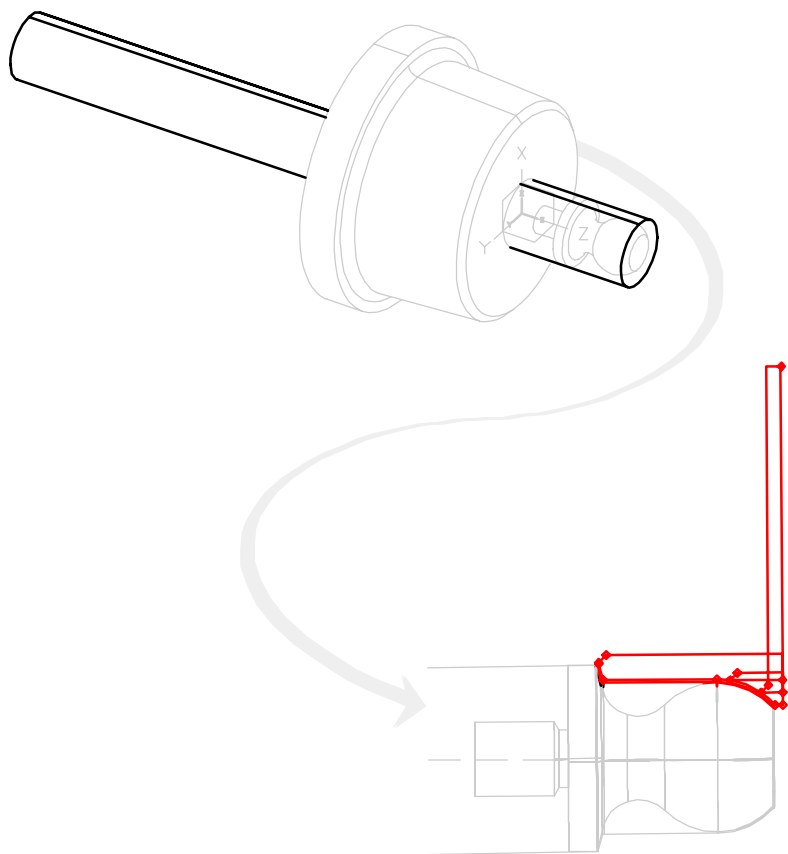
What: Modify the opgroup by giving it a name.

How:

NC Job Planning form

OpGroup–1

OpGroup Specification form

Name: Rough Turning

Don't close the OpGroup Specification form.

What: Create an operation to rough the outer diameter of the trailer ball's end.

How:

OpGroup Specification form

Operation Selection form

 Category: *Turning*
 Type: *Rough Turn*
 Create

Don't close the Operation Specification form.

What: Name the operation and pick the surfaces to be machined.
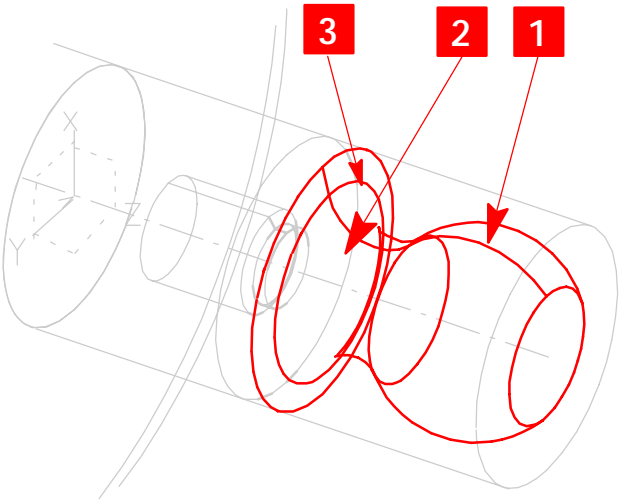
How:

Operation Specification form

Name: Rough without the Undercuts

1

2 shift pick

3 shift pick

Don't close the Operation Specification form.

What: Retrieve the tool from the catalog.

How:

Operation Specification form

Turning Tool Specification form

 Find... (next to *Combined Identifier*)

---

 80 deg diamond

 OK

Turning Tool Specification form

 OK

 Don't close the Operation Specification form.
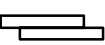
What: Generate the toolpath.
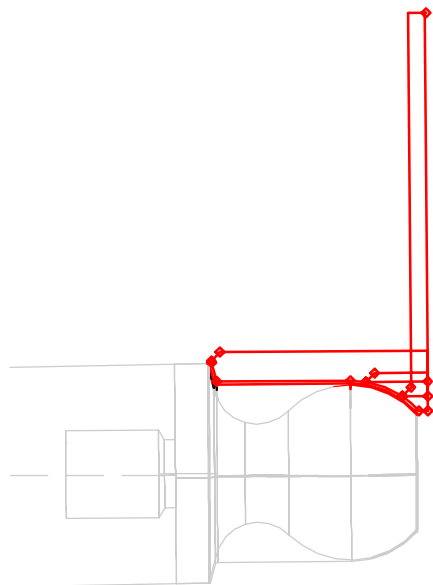
How:

Operation Specification form

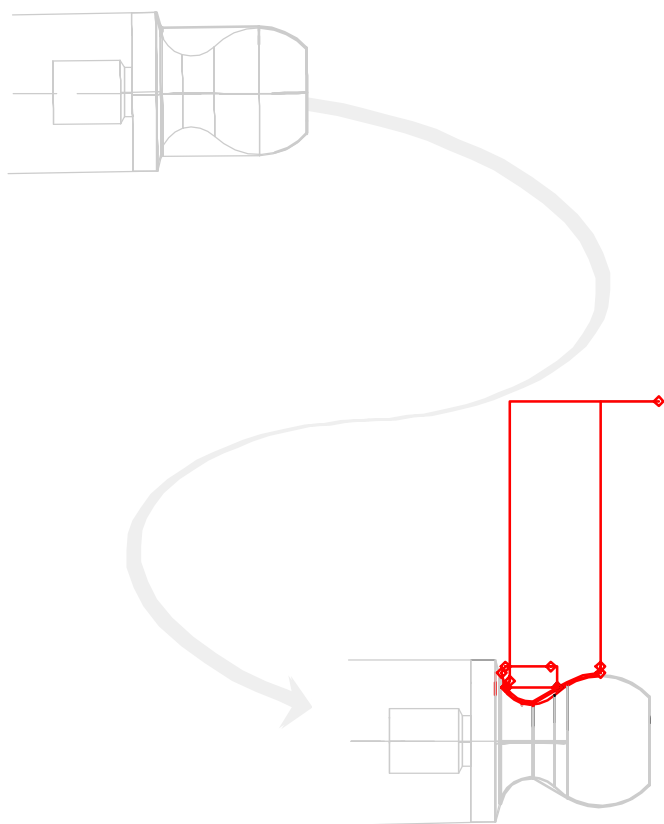## Recovery Point

 File
         Save

Things to notice
The tool doesn't cut into the undercut.

In the next steps, you'll create a rough turn operation to machine the undercut. You'll use a lighter tool suited for undercutting.

You'll also learn how to view the clearance line as you animate the tool.

What: Create another rough turn operation. With this operation, you'll clear out the material remaining on the selected surfaces.

How:
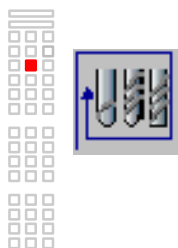
OpGroup Specification form

Deselect *Rough without the Undercuts* by pressing the Control key and selecting *Rough without the Undercuts*.

Operation Selection form

Category: *Turning*

Type: *Rough Turn*

Create

Don't close the Operation Specification form.

What: Name the new operation and accept the preselected surfaces.

How:

Operation Specification form

Name: Rough with Undercuts

Things to notice
The surfaces you selected in the previous operation are highlighted by default. Accept these surfaces for the new operation.

Don't close the Operation Specification form.

What: Retrieve the tool from the catalog.

How:

Operation Specification form

Turning Tool Specification form

 Find... (next to *Combined Identifier*)

Item Selection form

 55 deg diamond

 OK

 OK

Don't close the Operation Specification form.

What: Enable the operation to create undercuts on the diameters of the part.

How:

Operation Specification form

Machining Parameters form

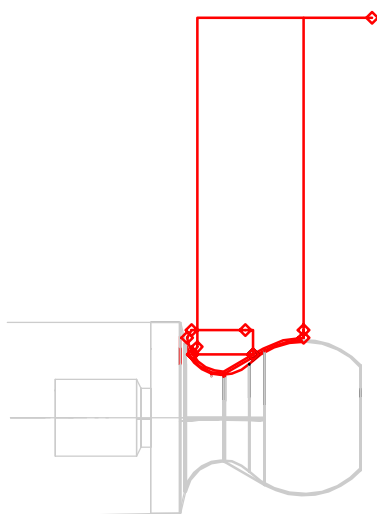 *Machine Undercuts on Diameters* (on)

 OK

Don't close the Operation Specification form.
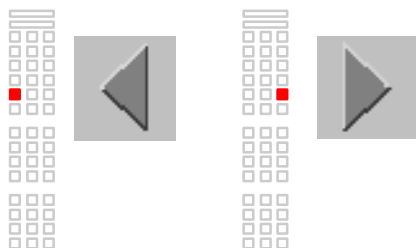
What: Generate the toolpath.
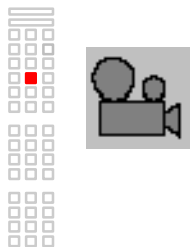
How:

Operation Specification form

Things to notice
This operation removed most of the material remaining on the ball of the hitch. You can compare the toolpaths by picking *Show Previous* and *Show Next*.

What: Display the trailing clearance line, then animate the tool.

How:

Animate Tool form

Tool Display form

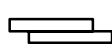 *Clearance Line Display* (on)

 OK

 Dismiss

Recovery Point

 File
 Save

Things to notice
Notice the uncut portion of the undercut is at the same angle as the trailing clearance line. The software can't violate the trailing clearance to remove material.

Warning!
Don't delete this model file once you're finished. You'll use this model file and job in the next tutorial.

Tutorial wrap-up

You've completed the Introduction to Turning tutorial.